AF THW 1764

NT03-001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Per Stobbe, et al.	
Serial No:	09/743,096	Examiner: Hien Tran
Filed:	04/17/2001	Group Art Unit: 1764
Title:	Diesel Exhaust Gas Filter	

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Sir:

Transmitted herewith is one (1) copy of an Appeal Brief (10 pages with 3 page Appendix) in the above-identified application.

Authorization is given by Corning Incorporated to charge the appropriate fee and any additional fees necessary due in connection with this filing to Deposit Account No. 03-3325.

Respectfully submitted,

Dated: September 19, 2006

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Kees van der Sterre

PATENT
NT03-001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant(s): P. Stobbe et al. Appeal Brief [Amended]

Serial No.: 09/743,096 Group Art Unit: 1764

Filing Date: April 17, 2001 Examiner: Hien Thi Tran

Title: Diesel Exhaust Gas Filter

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Kees van der Sterre

This Appeal Brief is being filed in support of the Notice of Appeal mailed herein on June 8, 2006 and the Notification of Non-Compliant Appeal Brief mailed herein on September 1, 2006. It contains the following sections under the corresponding headings as required by 37 CFR §41.37(c):

Real Party in Interest

The real party in interest in this case is Corning Incorporated, assignee of the entire interest in this application by virtue of an assignment recorded July 19, 2001 at Reel/Frame 011995/0828.

Related Appeals and Interferences

There are no related appeals or interferences

Status of Claims

Claims 1-9, 11, 12, 14-16..... Rejected
Claims 10, 13 ..... Canceled
The claims on appeal are claims 1-9, 11, 12, and 14-16.

Status of Amendments

Appellants' proposed amendment of claims 1 and 3 under 37 CFR§1.116, mailed herein on June 8, 2006 has not been entered.

Summary of Claimed Subject Matter

The invention claimed is a specially modified porous filter body for filtering soot particles from diesel engine exhaust gases. The filter body is of the generally known wall flow filter type which comprises a porous ceramic or metallic honeycomb structure consisting of an array of parallel channels separated from each other by porous channel walls, each of the channels being plugged at one end and open at the other end of the honeycomb structure (page 1, lines 1-10 and page 17, lines 5-14 of the specification).

The plugs in the claimed filter are patterned in known fashion so that channels closed at the filter outlet (i.e., the inlet channels) are interspersed with neighboring channels closed at the filter inlet (the outlet channels) (page 17, lines 11-13), whereby exhaust gas entering the inlet channels must traverse the porous channel walls into the neighboring outlet channels before being discharged from the filter. As so constructed, all of the channel walls of the structure have a gas inlet surface facing the inlet channels and a gas

outlet surface facing the outlet channels, the exhaust gas thus traversing the channel walls from the inlet surfaces to the outlet surfaces thereof. The invention claimed resides in modifications of this basic filter design to improve the ability of the filter to (i) trap soot particles within the porous walls of the filters and (ii) promote the catalytic combustion of the trapped soot particles.

As set out in claim 1, the invention provides a porous filter body for filtering soot particles from diesel engine exhaust gases (page 1, lines 4-10 of the specification), the filter body being a honeycomb wall flow filter body in which interconnected porous filter walls define a multiplicity of channels, each channel being closed at one end and neighboring channels being closed at alternate ends (page 17, lines 5-17 of the specification). Each filter wall has a gas inlet surface and a gas outlet surface [the latter shown as element 22 in Fig. 5 of the drawings], the filter walls being made of a material based on metallic and/or ceramic particles being bonded together (page 7, lines 13-16 of the specification; particles [10] in Fig. 2A of the drawing).

The porosity of the filter wall is constituted by interconnected voids (element [14] in Fig. 2A of the drawing) defined between the metallic and/or ceramic particles (page 7, lines 31-34 of the specification). Thus the particles directly define the pores of the material.

In accordance with the improvement outlined in claim 1, the filter body has a mean pore size in the range of 30-200μm for allowing the intrusion of soot particles into the wall structure of the body (page 4, lines 29-32 of the specification). Further, a catalytically active material for catalyzing oxidation of the soot is deposited on at least part of those surface parts of the metallic and/or ceramic particles which are exposed to the voids in the body (page 4, lines 9-17 of the specification). And finally, a porous membrane having a mean pore size in the range of 1-50μm and a thickness in the range of 0.05-0.4mm is applied to the gas outlet side only of the filter walls (page 5, lines 7-11 and page 15, lines 21-30 of the specification).

In filter operation, the relatively large mean pore size of the body permits the intrusion of soot particles into the pores, where they may readily come into contact with the catalytically active material disposed on the surfaces of the ceramic or metallic particles forming the pores for more

effective soot oxidation. Further the presence of the thin porous membrane of small pore size on the outlet surfaces only of the channel walls, can act to trap the soot particles within the walls for more complete combustion by the catalytically active material.

Grounds of Rejection To Be Reviewed on Appeal

Whether the Examiner erred in finally rejecting claims 1-5, 7, 11-12 and 14-16 of the application under 35 U.S.C. §103 as unpatentable over published European application EP 736,503 (Kondo) in view of U.S. Patent No. 4,857,089 (Kitigawa);

Whether the Examiner erred in finally rejecting claim 6 of the application under 35 U.S.C. §103 as obvious from the combination of Kondo and Kitagawa applied as above, further in view of U.S. Patent No. 5,041,407 to Williamson; and

Whether the Examiner erred in finally rejecting claims 8 and 9 of the application under 35 U.S.C. §103 as obvious from the combination of Kondo alone or with Kitigawa taken with WO 89/09648 (WO '648).

Argument

As outlined above, the present invention relates to catalyst-containing wall flow filters for the removal of soot particulates present in diesel engine exhaust gases. The filters of the invention are characterized in that the filter walls are formed of sintered particles and exhibit relatively large pore diameters to allow soot penetration. Further, the sintered particles within the walls are provided with catalyst coatings to promote soot oxidation within the filter walls, and the outlet side walls only of the filters are covered by a thin membrane of small pore size to prevent soot from passing through the filter without sufficient exposure to the catalyst. The advantageous mode of operation of these filters is explained by the Applicants with reference to Fig. 7 of the drawings at page 16, lines 11-19 of the specification:

> *This invention relies on [a] very open filter structure, where the gas flow 4 tries to pass the soot particles 2 through with low filtration efficiency. As no well-defined soot cake is generated the soot*

> *penetrates into the filter wall and there is no well-defined combustion zone. The combustion takes place inside the filter wall itself, or the combustion zone is on the very grain surface and creates a boundary layer 3 with the same thickness as the filter wall. The boundary layer is only well-defined relative to each wall grain surface and not to the filter wall surface. The membrane 5 on the filter wall outlet side ensures that the trapping efficiency is kept high.*

Claims 1-5, 7, 11-12 and 14-16 of the application directed to the above-described invention have been rejected under 35 U.S.C. §103 as obvious from the combination of EP 0 736 503 to Kondo et al. (Kondo) taken with U.S. Patent No. 4,857,089 to Kitigawa et al. (Kitigawa). In the Appellants' submission, this rejection constitutes clear error for at least the following reasons.

First, the Appellants' claims are clearly directed to filters having membrane coatings on the outlet side only of the filters. As is evident from the above description, that placement of the membrane is required in order to both allow soot penetration into the filter, and to assure that the soot is trapped in the filter for oxidation, rather than allowed to escape from the filter through the outlet channels.

The record is clear that Kondo et al. do not teach membrane placement on the outlet side of the filter, only. Fig. 4 of the reference, for example, shows a catalyst coating on both inlet and outlet sides of the filter, while Fig. 18 shows a catalyst coating on the inlet side only. The Examiner has therefore correctly acknowledged that Kondo is "clearly silent" as to whether the coating is applied to the outlet side only.

Kondo is similarly devoid of any teaching as to membrane location or function that would be suggestive of the invention. Instead, the location of the coating according to Kondo is quite evidently a matter of indifference. The two coating locations actually illustrated by Kondo are not differentiated as to purpose or effect. Thus the skilled artisan evaluating the teachings of that reference would consider the various embodiments of the disclosed product to be equivalent insofar as the function of membrane is concerned.

What the Appellants have now discovered and disclosed is that the location of the membrane, if that membrane is of appropriate thickness and porosity, is not a matter of indifference. That is because the application of a

membrane to the outlet side only of the filter allows easy soot penetration with full access to the catalyst by the soot in the exhaust stream, and prevents escape of the fine soot particulates through the outlet surfaces of the channels without contact with the catalyst.

To supply the elements of the invention not taught or suggested by Kondo, the Examiner has cited U.S. Patent No. 4,857,089 to Kitigawa et al. (Kitigawa). Kitigawa relates to the application of flow control coatings to portions of exhaust filters to direct exhaust flows preferentially through some portions of the filter walls and not others. The reference was relied on by the Examiner to show the placement of coatings on either or both of the inlet sides and outlet sides of a filter.

The teachings of Kitigawa are insufficient to provide the elements of the invention missing from Kondo in at least three respects. First, as in Kondo, whether the Kitigawa wall coatings are positioned on the inlet surfaces or the outlet surfaces is again a matter of indifference. Thus, from the viewpoint of Kitigawa, those coating locations are equivalent insofar as their ability to impede exhaust flow through the coated portions of the filters is concerned.

Secondly, neither the inlet nor the outlet coatings of Kitagawa cover the entire filtration surfaces of the filter, being instead limited to 8/10ths of any filter surface. Coverage of the full lengths of the filter walls in Kitigawa is avoided because it results in filter damage (Reference Example 13), whereas the Appellants' membranes are applied to the full lengths of the filter walls in order to secure catalyst contact in each case required. Because the coating coverage utilized by Kitigawa is limited, the membrane function required by the Appellants, i.e., the efficient trapping of soot within the filter walls for more effective catalytic treatment, cannot be provided.

And finally, the porosities of the Kitigawa coatings are not disclosed, and the coating layers of Kitigawa must be relatively thick in order to prevent excessive the soot buildup leading to excessive temperature increases in the filter during soot burn-out (column 4, lines 7-10 of the patent). Thus Kitagawa fails to teach or suggest providing an outlet side membrane of 0.05-0.4 mm thickness with a pore size in the range of 1-50 μm on a filter of relatively

coarse porosity, which membrane could provide coverage operative to trap particulates within the filter for oxidation by a catalyst therein, as the Appellants' claims require.

In summary, neither Kondo nor Kitigawa discloses the criticality of outlet side membrane placement for efficient catalytic treatment of trapped soot in a wall flow filter, and neither discloses the characteristics of such an outlet side membrane that are required to secure that efficiency. Accordingly, the Appellants respectfully submit that the Examiner erred in rejecting claims 1-5, 7, 11-12 and 14-16 of the application under 35 U.S.C. §103 as unpatentable over Kondo in view of Kitigawa, and that that rejection should be reversed.

The Examiner next rejected claim 6 of the application under 35 U.S.C. §103 as unpatentable over the combination of Kondo alone or with Kitigawa, taken further in view of U.S. Patent No. 5,041,407 to Williamson. The citation of Williamson was to show the known use of substances such as alumina and barium in a catalyst washcoat.

Like Kondo and Kitigawa, Williamson also fails to disclose a wall flow filter comprising a catalyst coating in combination with a thin, small-pore membrane on the gas outlet side of the filter. Thus Williamson demonstrates that catalyst washcoats are known, but fails to supplement the teachings of the principal references in a manner that would suggest a porous wall flow filter body with a catalyst disposed within the pores of the body and a membrane layer disposed only on the outlet surfaces thereof for improved catalytic performance.

For these reasons the Appellants respectfully contend that the Examiner erred in rejecting claim 6 under 35 U.S.C. §103 as unpatentable over Williamson, Kitigawa and Kondo, and that that rejection should be reversed.

Finally, the Examiner rejected claims 8 and 9 of the application as unpatentable under 35 U.S.C. §103 over the combination of Kondo alone or with Kitigawa taken with WO 89/09648 ('648). The '648 disclosure was introduced to show wall flow filter bodies made from SiC particles within the

size range of 75-170μm, sintered to form wall flow filters having a porosities of 50-90%.

Even given that teaching, however, the combination of Kondo, Kitigawa and WO '648 still suggests at most a silicon carbide wall flow filter with a conventional catalyst washcoating. No teaching or suggestion to provide a catalyzed wall flow filter featuring a thin, small-pore membrane on the gas outlet side only of the filter is apparent. Accordingly, the subject matter of claims 8 and 9 of the application is clearly patentable over the combination of Kondo alone or with Kitigawa taken with WO '648, and therefore the Examiner's rejection of claims 8 and 9 under 35 U.S.C. §103 was in error and should be reversed.

The After-Final Amendment

In the advisory action mailed herein on July 24, 2006, the Examiner refused entry of the following amendment to claim 1 of the application:

> *1. (proposed) In a porous filter body for filtering soot particles from diesel engine exhaust gases, the filter body being a honeycomb wall flow filter body in which interconnected porous filter walls, each of which has a gas inlet surface and a gas outlet surface, define a multiplicity of channels, each channel being closed at one end and neighbouring channels being closed at alternate ends, the filter walls being made of a material based on metallic and/or ceramic particles being bonded together, the porosity of the filter wall being constituted by interconnected voids defined between the metallic and/or ceramic particles, the particles directly defining the pores of the material, the improvement wherein:*
>
> *the porous filter body consists essentially of the honeycomb wall filter body, a catalytically active material catalyzing the oxidation of soot, optionally a surface-increasing coating, and a porous membrane applied to the gas outlet side only of the filter walls;*
>
> *the filter body has a mean pore size in the range of 30-200μm for allowing the intrusion of soot particles;*
>
> *the ~~a~~ catalytically active material catalyzing oxidation of soot is deposited on at least part of those surface parts of the metallic and/or ceramic particles which are exposed to the voids, and*
>
> *the ~~a~~ porous membrane has ~~ving~~ a mean pore size in the range of 1-50μm and a thickness in the range of 0.05-0.4mm ~~is applied to the gas outlet side only of the filter walls~~.*

The Examiner's refusal of entry was on the ground that the amendment raised new issues that would require further consideration and/or search.

The Appellants respectfully submit that this holding was clearly in error. The proposed amendment dealt only with a long-standing and central issue in

the case, and its sole purpose was to remove that issue for the purposes of this appeal.

The issue addressed and resolved by this amendment concerned whether the finally rejected claims in fact read on the Kondo disclosure of a particulate filter incorporating both inlet-side and outlet-side coatings. Relevant to that issue are: (i) the Examiner's initial rejection of claim 1 under 35 U.S.C. §102 as fully met by Kondo, later withdrawn, and (ii) the Examiner's statement at page 3 of the Final Rejection, as follows:

> *"The apparatus of Kondo et al is substantially the same as that of the instant claim, but fails to disclose whether the coating 1 may be applied to the outlet side only.*
>
> *However, since the claim is treated as open language, it does not exclude the additional membrane at the inlet side, and therefore meet (*sic*) the instant claims."*

The record will show that Appellants have consistently argued, and that the Examiner has, from time to time, recognized, that the claims are restricted to a filter body comprising an outlet side membrane only. Yet at this late stage of the prosecution, and after two final rejections, the Examiner in effect has again expressed the view that the finally rejected claims encompass bodies with membranes on the inlet as well as the outlet surfaces of the channels.

The sole purpose of the Appellants' proposed Amendment after final rejection under 37 CFR §1.116 was to remove this issue from the appeal. Even before the submission of this amendment, and certainly after that submission, the possibility of construing the claim as open language that would encompass the Kondo et al. device was clearly not possible.

In any case, the issue addressed by the Appellants §1.116 amendment was clearly not new, nor did it raise any issue requiring further consideration or search. Moreover, it would have simplified the issues to be considered on this appeal.

For the above reasons, the Examiner's refusal to enter the amendment was clear error. Whether this error is one that the Board may consider in connection with this appeal is not clear. However, the Appellants continue to urge that entry of the amendment would reduce the issues in this case, and that the Board should consider the amendment as one which would clearly

place the claims in condition for allowance, should the final rejection of the Appellants' claims be reversed and this application remanded for further proceedings not inconsistent with that reversal.

The Appellants believe that no extension of time is necessary to make this Amended Appeal Brief timely, but contingently request that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as is necessary to make this filing timely, if in fact such an extension is required. In that contingency the Office is hereby authorized to charge any necessary extension fee or surcharge to the above-identified deposit account.

Respectfully submitted,

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September 19, 2006

Claims Appendix

[Claims to be reviewed on appeal]

1. In a porous filter body for filtering soot particles from diesel engine exhaust gases, the filter body being a honeycomb wall flow filter body in which interconnected porous filter walls, each of which has a gas inlet surface and a gas outlet surface, define a multiplicity of channels, each channel being closed at one end and neighbouring channels being closed at alternate ends, the filter walls being made of a material based on metallic and/or ceramic particles being bonded together, the porosity of the filter wall being constituted by interconnected voids defined between the metallic and/or ceramic particles, the particles directly defining the pores of the material, the improvement wherein:

the filter body has a mean pore size in the range of 30-200μm for allowing the intrusion of soot particles;

a catalytically active material catalyzing oxidation of soot is deposited on at least part of those surface parts of the metallic and/or ceramic particles which are exposed to the voids, and

a porous membrane having a mean pore size in the range of 1-50μm and a thickness in the range of 0.05-0.4mm is applied to the gas outlet side only of the filter walls.

2. A filter body according to claim 1, wherein the filter walls are made of SiC particles bonded together.

3. A filter body according to claim 1 wherein the material of the filter walls is coated with a coating to increase the active contact surface area of the filter body and act as an anchor for the catalytically active material.

4. A filter body according to claim 3, wherein the surface-increasing coating is constituted by particles bonded to the particles on which the material of the filter walls is based.

5. A filter body according to claim 3 wherein the surface-increasing coating is an alumina wash coat.

6. A filter body according to claim 5, wherein the alumina wash coat is stabilized by means of additives comprising elements from group I-VI.

7. A filter body according to claim 1 wherein the filter walls are coated with a coating to increase the actual surface area of the filter walls structure and coated with a catalytically active coating based on metals as Ru, Rh, Pt, Pd, Ir, Ni, Cu, V, W, Y, Ce, Ti, Zi or combinations hereof or oxides hereof.

8. A filter body according to claim 1 wherein the ceramic and/or metal particles on which the material of the filter wall is based have a particle size in the interval 1-250 µm.

9. A filter body according to claim 8, wherein the ceramic and/or metal particles on which the material of the filter wall is based have a particle size in the interval 10-150 µm.

10. (canceled)

11. A filter body according to claim 1 , wherein the pores of the filter walls have a mean pore size in the interval of 40-80 µm.

12. A filter body according to claim 1 wherein the porosity of the filter walls is in the interval of 30-90%.

13. (canceled)

14. A filter body according to claim 1 wherein the porous membrane applied to the gas outlet side of the filter walls is constituted by metallic and/or ceramic particles and/or fibers.

15. A filter body according to claim 14, wherein the size of the particles and/or fibres is smaller than the pore size of the material of the filter walls.

16. A filter body according to claim 1 wherein the mean pore size of the porous membrane applied to the gas outlet side of the filter walls is in the interval of 2-15 μm.